

PATENT SPECIFICATION

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(54) METAL TREATMENT PROCESS

(71) We, BRITISH STEEL CORPORATION, a Corporation incorporated and existing under the Iron and Steel Act 1967 whose principal office is at 33 Grosvenor Place, London, S.W.1 do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to the descaling of metal bodies and is particularly although not exclusively concerned with the cleaning of continuous steel strip by descaling and subsequent oiling of the strip.

According to one aspect of the invention, there is provided a continuous process for treating a metal body, comprising the steps of moving the metal body along a predetermined path and, whilst the body is moving along the path, blasting the body with abrasive to descale the body, washing the blasted body, and coating the washed body with oil.

According to another aspect of the invention, there is provided apparatus for treating a metal body, comprising means for moving the metal body along a predetermined path, means for blasting the body with abrasive to descale the body whilst moving along said path, means for washing the blasted body whilst moving along said path, and means for coating the washed body with oil whilst moving along said path.

The abrasive is preferably a wet abrasive comprising, for example, a mixture of water and fused alumina, and the process may include a secondary blasting of the body, prior to the washing step, with, for example, glass beads (wet or dry) for smoothing and brightening the surface of the metal body.

The metal body to be treated is preferably elongate and may be, for example, in

strip form, in wire form, or in rod form, and may be stored in a coil. Where the body is a coiled strip product, the means for moving the strip along a predetermined path may advantageously comprise successively an uncoiler, pinch rolls and flattening rolls for feeding the strip to treatment chambers for the descaling, washing and oiling of the strip, and a recoiler for withdrawing the strip from the treatment chambers.

For a better understanding of the invention and to show how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings in which:—

Figure 1 shows an apparatus for cleaning, descaling and oiling continuous steel strip embodying the invention; and

Figure 2 shows an alternative form of the apparatus invention.

A continuous steel strip 1 is moved along a predetermined path defined by an uncoiler 2, a set of pinch rolls 3, a five roll flattener 4, vertical guide rolls 5, horizontal guide rolls 6, an abrasive spray chamber 7, a wash chamber 8, an oiling chamber 9 provided with guide rolls 25 and 26, and a recoiler 10.

The uncoiler 2 comprises a drum mounted for axial rotation to permit uncoiling of the steel strip 1 which is coiled on the drum, and means is provided for directly driving the drum in rotation in order to feed the strip to the pinch rolls 3, after which the uncoiler drive is arranged to cut out.

The pinch rolls 3 are powered to initially feed the steel strip 1 through the three chambers 7, 8 and 9 and onto the recoiler 10, and the pinch roll drive is arranged to cut out when the strip has been fed into the recoiler. The five roll flattener 4 is also powered to provide continuous additional drive for the steel strip 1. The guide rolls 5

and 6 serve to correctly position the steel strip 1 as it enters the abrasive spray chamber 7.

The abrasive spray chamber 7 comprises a plurality of nozzles 11 for blasting wet abrasive onto both sides of the steel strip 1, which nozzles are arranged in two or more lines, each extending transversely of the strip 1. Each line of nozzles is pivotable about the centre of the line, in order to accommodate varying widths of steel strip, and the nozzles may be adjustable for height (i.e. distance from the strip). The wet abrasive is supplied under pressure to the nozzles 11 from a pressure unit 12, and used wet abrasive is recirculated to the pressure unit 12 by means of a pump 13.

The wash chamber 8 comprises two or more lines of nozzles 14 for spraying both sides of the steel strip 1 with wash fluid, which in this example includes water and is supplied from a tank 15, the nozzles 14 possibly being arranged similarly to the nozzles 11. The entrance to the abrasive spray chamber 7, the entrance to the wash chamber 8, and the exit from the wash chamber 8, are provided with respective sets of rubber flaps 16, 17 and 18. The chambers 7 and 8 are provided with respective vapour outlets 27 and 28.

The oiling chamber 9 comprises two or more lines of nozzles 19 for spraying both sides of the steel strip 1 with a dewatering oil supplied from a tank 24, the nozzles 19 possibly being arranged similarly to the nozzles 11 and 14. Water from the wash fluid and oil settle on the bottom of the chamber as respective layers 21 and 20. A pump 23 is provided for continuously recirculating oil from the layer 20 to the tank 24, and a tap 22 is provided for periodically draining off the water layer 21. The rollers 25 and 26 guide the steel strip 1 as it enters and leaves the oiling chamber 9.

The recoiler 10 is powered to recoil the steel strip 1 as it leaves the oiling chamber 9, and is arranged to provide the main drive for the strip 1 after the strip has been fed to the recoiler 10 by the pinch rolls 3.

In use of the apparatus the steel strip 1 is uncoiled by the uncoiler 2 which feeds the strip to the pinch rolls 3. The uncoiler drive then cuts out and the pinch rolls 3 are directly driven to feed the strip to the five roll flattener 4. The flattener 4 serves to remove the curvature from the strip 1 which is then guided by the guide rolls 5 and 6, through the rubber flaps 16, into the abrasive spray chamber 7, where the steel strip 1 is blasted on both sides with wet abrasive comprising a mixture of water and fused alumina. The blasting is to clean the steel by removing any scale from the

steel. A small surface layer of steel will normally also be removed by the blasting, but experiments have indicated that the amount of steel removed after a satisfactory descaling is less than might be expected after a conventional descaling process such as pickling (immersion of the steel in acid). The wet abrasive is continuously recirculated *via* the pump 13.

The blasted steel strip 1 passes from the abrasive spray chamber 7 through the rubber flaps 17 to the wash chamber 8 where it is sprayed on both sides with wash fluid comprising water and a cleaning agent in order to remove all particular matter (alumina, steel and scale particles) from the surface of the steel strip 1. The wash fluid may be filtered and recirculated, and may be supplied from a high pressure unit rather than directly from the tank 15. The cleaning agent could be a small quantity of oil added to the water. In the drawing, the two chambers 7 and 8 are shown as joined to form a single cabinet, but the chambers may be separate units.

The steel strip 1 passes out of the wash chamber 8 through the rubber flaps 18 which remove the bulk of the washing fluid, and through the rollers 25 into the oiling chamber 9. In the oiling chamber 9, the steel strip 1 is sprayed on both sides with the dewatering oil which is recirculated *via* the pump 23 to the tank 24 which is regularly topped up. The oil serves to remove water from the steel strip 1 and remains on the strip to preserve the finish provided by the abrasive spray and possibly to be of further use in later processing, e.g. pressing, of the steel. The water removed from the steel which settles as the separate layer 21 underneath the layer 20 of oil is periodically drained off from the bottom of the chamber 9 *via* the tap 22. As the oil serves to remove water from the strip, it may not be essential to dry the strip, for example with hot air, as it emerges from the wash chamber 8.

The oiled steel strip 1 passes out of the oiling chamber 9 through the rolls 26 and is finally recoiled on the recoiler 10. In order to keep the line speed (the speed of the strip 1 along the aforesaid pre-determined path) constant, the increasing coil diameter on the recoiler is compensated for by automatic adjustment of the speed of rotation of the recoiler, the reference for this being taken from either the pinch rolls or the flattener rolls. Additionally, the line speed may be varied to cope with varying thickness of scale on the steel strip.

The above described apparatus and process are intended for descaling and oiling hot rolled and cold reduced wide and narrow steel coil, but with suitable adaptation of the means for moving the steel

strip successively through the abrasive spray, wash and oiling chambers, the apparatus and process may readily be applied for the continuous descaling and oiling of many elongate metal bodies.

The above described apparatus and process may be modified such that after the steel strip has been blasted with wet abrasive and prior to washing in the chamber 8, it is subjected to a secondary blasting with either wet or dry glass beads, in order to improve the smoothness and brightness of the steel strip. After blasting and prior to washing, the strip may be cleaned by a fibre brush. Where appropriate, after the strip has been washed with wash fluid and prior to oiling in the chamber 9, it may be subjected to further washing with clear water.

Figure 2 shows an alternative form of the apparatus in which the steel strip is passed through the apparatus in a vertical plane rather than horizontally as shown in Figure 1. Strip is fed from an uncoiler 30 into pinch rolls 31. Welding equipment 32 is provided to enable new coils of strip to be joined on to the continuous length of steel strip passing through the apparatus. Welding equipment 32 is preferably a spot welder, although any conventional welding equipment will do.

After the pinch rolls 31 the strip enters flattening rolls 33 and then via guide rolls 34 into an abrasive spray chamber 35. Hinged spray nozzles 36 are provided and there is a vapour outlet 37. As the strip comes out of the abrasive spray chamber 35 it passes into two consecutive washing stations 38, 39. First there is a water wash 38 and then a soluble oil wash 39.

As the strip comes out of the oil wash 39 it passes through an air dryer 40 and then between guide rolls 41. At this stage the strip is coated with a layer of oil by means of an oil drip feed 42, which replaces the spray chamber in Figure 1. The strip then passes through load bearing guide rolls 43 and meets a snubber roll 44 and then enters a variable speed recoiler 45.

In the past the function performed by apparatus according to this invention has more usually been carried out by using an acid pickling process. The acid pickling resulted in an effluent liquor which is highly dangerous and difficult to dispose of. The

apparatus according to the present invention requires very little space compared with that for an acid pickling plant and does not produce undesirable effluents.

WHAT WE CLAIM IS:—

1. A continuous process for treating a metal body comprising the steps of moving the metal body along a predetermined path and, whilst the body is moving along the path, blasting the body with abrasive to descale the body, washing the blasted body, and coating the washed body with oil.

2. A process according to claim 1 and in which the abrasive is a wet abrasive comprising a mixture of water and fused alumina.

3. A process according to claim 1 or claim 2 and including secondary blasting of the body prior to the washing step for smoothing and brightening the surface of the metal body.

4. Apparatus for treating a metal body comprising means for moving the metal body along a predetermined path, means for blasting the body with abrasive to descale the body whilst moving along said path, means for washing the blasted body whilst moving along said path, and means for coating the washed body with oil whilst moving along said path.

5. Apparatus according to claim 4 and in which the means for moving the strip along a predetermined path comprises successively an uncoiler, pinch rolls and flattening rolls for feeding the strip to treatment chambers for the descaling, washing and oiling of the strip, and a recoiler for withdrawing the strip from the treatment chambers.

6. A method of cleaning a continuous metal strip substantially as hereinbefore particularly described.

7. Apparatus for cleaning a continuous metal strip substantially as hereinbefore particularly described and as illustrated in Figure 1 of the accompanying drawings.

8. Apparatus for cleaning a continuous metal strip substantially as hereinbefore particularly described and as illustrated in Figure 2 of the accompanying drawings.

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and
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2 SHEETS

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the Original on a reduced scale.
SHEET 1

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the Original on a reduced scale.
SHEET 1

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FIG. 1.

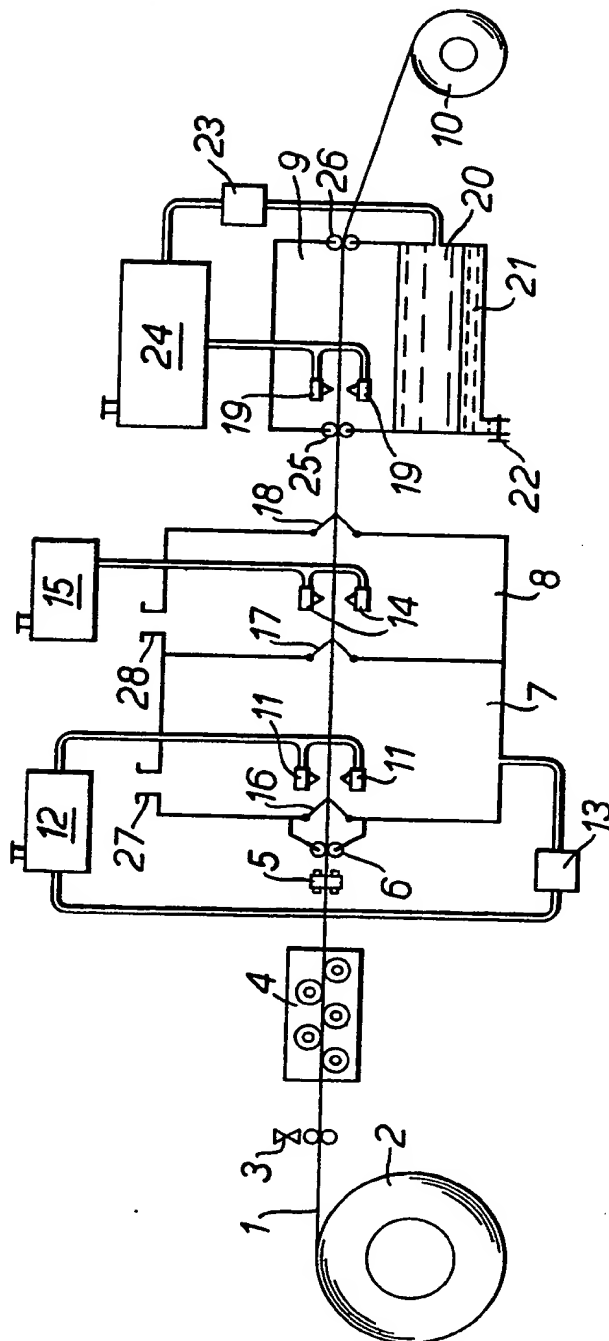
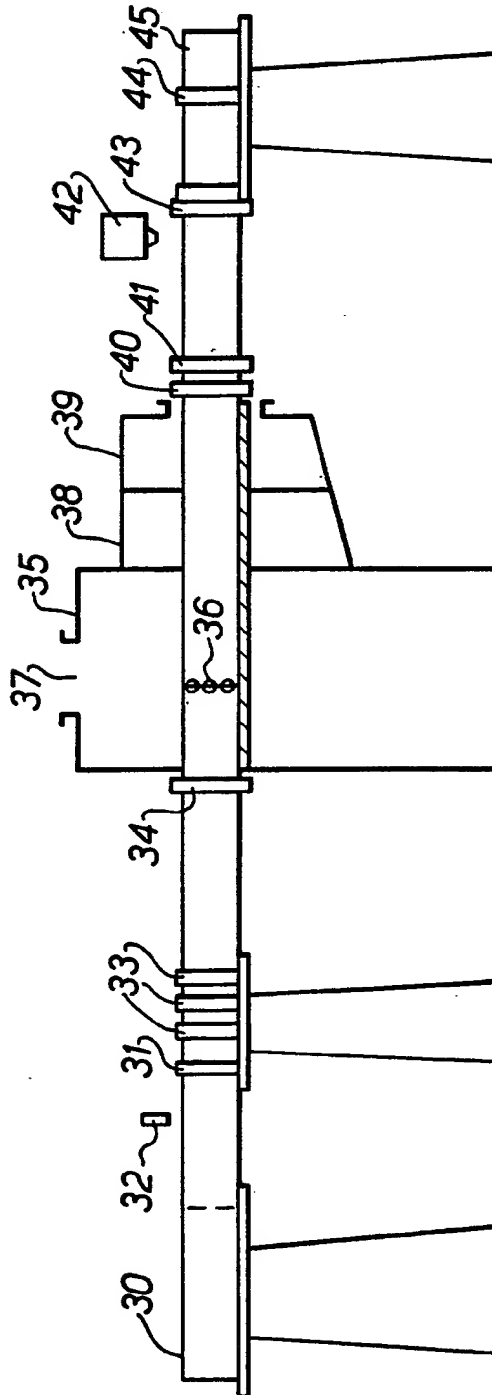


FIG. 2.



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2 SHEETS

COMPLETE SPECIFICATION

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SHEET 1

FIG. 1.

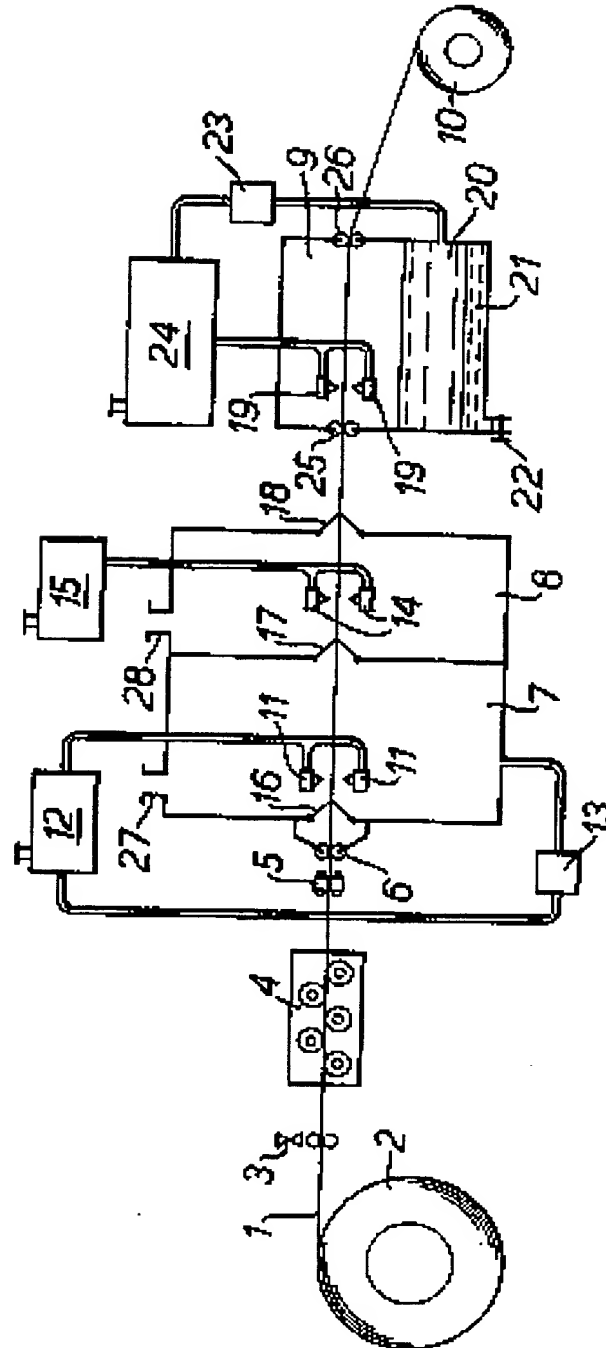


FIG. 2.

